introduced into the first vessel through the opening. At the same time a quantity of weak glucose liquor obtained in the final washing of the solid residuum in the filter press is inducted through a pipe at the top of the converter. Water is also admitted from the tank. The proportions of the glucose liquor and water may be equal, and the aggregate quantity required is about ten or twelve gallons for each bushel of grain. The agitator is then set in motion for the purpose of thoroughly commingling the contents of the converter. Steam is also simultaneously let into the imperforate pipes, for the purpose of raising the temperature of the mass to 190° Fahr., and when this has been done steam is shut off, all openings are closed, the gas cocks opened, and the commingled gases and atmospheric air passing from the receiver to the pump are forced into the converter through the perforated pipe or worm.

The agitator being kept in motion, these gases readily permeate the mass and come in contact with every particle, so that a very perfect conversion is effected. When the usual tests and reagents—iodine, alcohol, cupric liquors, and the saccharometer—indicate the desired conversion has taken place, the admission of gases is cut off by turning a cock, and a cock on the other side of the converter is then opened to allow discharge of steam from the perforated pipe into the now transformed mass. The action of the steam liberates the gases that are not assimilated, and rapidly forces them out of this converter into the other converter, wherein a charge of meal, weak glucose liquor, and water has been admitted, mixed, and heated to the proper degree (190° Fahr.), while the conversion has been thus going on in the first converter. Thus the gases, which are still chemically active after the conversion of the first charge, are utilized in the treatment of the next, thereby avoiding loss and effecting a considerable economy in the converting process. After the first charge has been converted, the auxiliary gas generators are therefore only required to furnish such additional quantity of gas as is necessary to supply the deficit resulting from the loss of gas which inevitably attends the operation on each charge. While conversion is going on in the second vessel, the first one is being discharged and recharged, and at the proper time the free gases in the second converter are forced back into the first converter, where they effect such further conversion as they are capable of, and thus the operation of alternate charging and forcing of gases from one converter into the other is continued. The converted mass is discharged into tanks and cooled by water passed through the coil pipe while being agitated by the revolving stirrer.

This invention was recently patented by Messrs. A. C. Landry and C. Lauga, of New Orleans, La.

A New Mode of Burial.

At the recent general assembly of cement manufacturers at Berlin, Dr. Fruhling described a new application of cement. He explained that it would be easy to transform corpses into stone mummies by the use of Portland cement, that substance when hardened not in any way indicating the organic changes going on within it. He further illustrated the subject by describing various industrial uses of lime as a preventive of decomposition. The cement in hardening takes an accurate cast of the features which it incloses, thus allowing of their exact reproduction after the lapse of centuries. It is suggested to use coffins of rectangular shape, it being further considered by Dr. Fruhling that underground sepulture is needless, as the coffins soon become practically masses of stone, and can therefore be built into pyramids.

Crippling the Patent Office.

In accordance with legislation by the last Congress, the force of the Patent Office was reduced, July 1, by the discharge of twenty-five clerks. Commissioner Marble says that this reduction will necessarily cripple the efficiency of his office to a considerable extent, and it will probably compel inventors to suffer additional delay in many cases.

The Patent Office contributes a large sum yearly to the national treasury, and is therefore much more than self-sustaining. Justice to the inventors of the country would seem to demand that their business should not be injured and their progress delayed by the mistaken economy of reducing the already inadequate force of the Patent Office.

A Single Coal of Fire.

Property to the value of nearly a quarter of a million dollars was destroyed, one life lost, and twelve persons injured by a fire at a wharf in Brooklyn, N. Y., July 19, caused by a coal of fire being blown from the furnace door of the boiler of a hoisting engine, while the fire was being raked. A cargo of jute was being discharged, and the live coal blown among loose particles of the fiber scattered on the wharf set the material and the adjoining property on fire so quickly that the laborers had to flee for their lives, a number on the vessels alongside the wharf jumping into the water, one of them being drowned.

Large Dynamos and Slow Speed.

Mr. J. E. H. Gordon, the eminent English electrician, has been a strong advocate of small dynamos driven at a high speed. Now, after a costly series of experiments, he finds that a large machine driven at a comparatively slow rate gives incomparably the best result and does not endanger life by flying to pieces.

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NEW YORK, SATURDAY, JULY 28, 1883.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 395,

For the Week ending July 28, 1883.

Price 10 cents For sale by all newsdealers.

LOCK-OUT OF CIGAR MAKERS.

July 19, 1883, will be remembered for two quite important events affecting the relations of employer and employed—the strike of about 7,000 telegraphers all over the country, and the lock-out of 10,000 cigar makers by cigar manufacturers of New York city. The inciting cause of the lock-out was the strike of 250 "Progressive Union" men in a manufactory because the proprietor employed also 26 "International Union" men, who refused to strike to change the end of pay week from Friday night to Thursday night. The employers belonging to the Manufacturers' Union thereupon shut up their manufactories. This closed fifteen concerns and left the employes without work.

This trouble appears to have arisen between the members of two rival workingmen's unions, rather than directly between workmen and employers, and the manufacturers say that if the 26 International Union men had been discharged at the demand of the Progressive Union men, the result would be that in shops where the International Union predominated a similar command would be made to discharge the Progressive Union men, and thus there would be no end of the trouble.

THE TELEGRAPHERS' STRIKE.

July 19, at noon, from the Atlantic to the Pacific, the members of the telegraphic brotherhood, to the estimated number of 7,000, struck work because of a neglect on the part of the principal telegraphic company, the Western Union, to notice their demands for an increase of pay, a reduction of hours of labor to eight hours for day and seven for night, an increased rate for over-work, and an equalization of compensation for employes of both sexes. The sight in New York city at the principal office, when the strike occurred, was remarkable. Several hundred operators, male and female, marched quietly out of the building when the signal was given, and took cars uptown to attend a secret meeting. Other operators not connected with the brotherhood were employed to fill the gap as far as was possible; and officers of the company who had been graduated from the instrument sat down to tables and furbished up their half forgotten skill.

In other cities the strike was less serious than in New York—except perhaps Chicago, where the operators of the Grain Exchange joined the strikers and brought stock business to a standstill. But reports from many cities and large towns showed that the immediate effects of the strike were not sufficient to bring business under the telegraphic system to an end; recruits and volunteers rapidly poured in, and served at least as makeshifts.

The average pay for commercial operators in the United States is $54.43 per month; average for commercial operators in Canada is $37.49 per month; average of railroad operators in the United States is $39.50; average for railroad operators in Canada is $29.12.

The demand for an increase of wages to the amount of 15 per cent, if conceded, with the equal payment of male and female operatives, the reduction of the hours of labor, and extra payment for Sunday work, has been estimated to compel an extra cost to the Western Union Telegraph Co. of at least $1,500,000, and to amount virtually to an increase of compensation to the operatives of about 40 per cent.

It is alleged on behalf of the Western Union Telegraph Company that these demands are excessive; and they will not accede thereto.

It would be difficult to find a more able, intelligent, and industrious body of people in the world than these telegraphers. The quietude with which they have conducted their strike, and the unanimity of their ideas in respect to their demands, afford ground for the inference that they know what they are about. The public will rejoice to see their wages increased and their hours of labor reduced, even if the prices for sending telegraph messages are slightly increased.

THE EXAMINATION OF BRIDGES.

The examination of bridges, relative to their safety, is a matter of vital importance to those passing over them, and is a duty that can only be reliably performed by one having long experience in bridge construction and a thorough knowledge of the mathematical questions involved. The mere running over of a locomotive, or an excessive load, is no guarantee of permanent safety. It is better to know how long a structure will carry an oft repeated light load in safety than how great a single load it will stand. The two seem to bear, for practical purposes, but little relation to one another.

One of the first points to be settled by the engineer is the plan of the bridge: if not in accordance with good practice of to-day, if so proportioned that some members are subjected to strains leaving too small a factor of safety, if not of sufficient strength to carry loads in excess of those for which it was designed, caused by increased traffic, then the structure is condemned without further consideration, or else changes obviating these difficulties are recommended. To ascertain this the parts are measured and the strains calculated, and if found to be safely within the limit of the strength of the iron, all is well so far. The operation also requires the examination of the effects produced by different loads, moving and at rest, and wind pressure.

The care and skill with which the parts were put together, the state of the rivets, bolts, and pins, and the deterioration of the iron due to atmospheric influences, come up for debate, and where the strength has been materially lessened, new parts are advised to be inserted. The ties, rails, and guard rails, although not entering into the problem of the safety of the bridge in a direct manner, are, nevertheless, responsible for the care of the trains, and are reported upon.

The piers supporting the bridge, and their foundations, present a more difficult task. If the piers are of iron or masonry, the work is comparatively easy. Undue settlement is readily discernible. In the case of pile foundations, the ravages of worms, being below low water line, are hid from view, and the weight the piles will bear cannot always be accurately found. The removal of one pile or more, and the condition of the remainder reasoned from its condition, is safe within certain limits.

If the exact strength of any member be in doubt, or approach too near the limit of its strength, decision is invariably cast in favor of the traveler, and the member is unhesitatingly condemned. That it will probably stand the strain is of no moment and is not thought of; but that it might possibly give way decides the question of its banishment.

HEATING AND HARDENING OF STEEL.

To understand how to properly harden and temper steel tools and other articles is fully as necessary to the machinist now, when most small tools are kept in stock by dealers, as it was twenty years ago, when each shop made its own tools. Lathe and planer cutters, cold chisels, milling cutters, and several other tools and appliances are liable to breakage, and must be redressed at the anvil, refinished, and rehardened and tempered. But many of these tools are ruined in the attempt, and this destruction usually comes in the hardening.

Some mechanics attach much importance to a hardening pickle, but probably failure comes as often by injury in heating the article as by hardening and tempering. An evenly distributed heat of the proper temperature is absolutely requisite to success, and this it is not always possible to assure by heating in an open fire. One portion of the article is liable to be overheated, while another portion is underheated; judging of the amount of heat by color is not always to be trusted; a dark corner or a cloudy day changes the conditions from a light shop and a sunny day sufficiently to make a great and telling difference in the amount of heat judged by sight.

A perfectly reliable method of heating for hardening is by means of the lead bath. It is an easy matter to keep in the shop a crucible or iron pot of lead to be used as occasion demands. The article to be heated for hardening will not suffer when in the lead bath, even if not closely watched, as is necessary at the open fire; the melted lead cannot pass to a degree of heat injurious to the steel. But one condition must be strictly observed—the lead must be pure and clean; it is best to buy the mercantile pig for this purpose. A manufacturer of pipe threading and pipe cutting tools in a New England city, desiring to abandon his old time open fire method for the lead bath, melted a lot of old lead pipe partially corroded, and mixed with it a quantity of type metal. His hardening was a failure until he used pure lead.

In order to harden well it is necessary to heat the article through and through. If the piece is of unusual thickness, as a tap or reamer of three inches or more in diameter, it is better to drill a hole through it from end to end, so that the heating can be even and the hardening be equal. A tap of four inches diameter broke squarely across in the hardening. It was of solid steel. The drilling of an inch hole from end to end was practiced, and a large number of the same size taps were hardened without a failure. The surfaces of the fracture of the broken tap showed plainly the evidences of unequal heating and uneven cooling.

ASPECTS OF THE PLANETS FOR AUGUST.

NEPTUNE

is morning star, taking the precedence of four other planets playing the same role, for the planetary interest during August centers on the morning sky. Five members of the solar brotherhood make their appearance at the beginning of the month in the following order: Neptune, Saturn, Mars, Jupiter, and Venus. This order of precedence they retain throughout the month. Neptune, if he were near enough, would be seen above the horizon about half past 11 o'clock in the evening. Saturn peers above the eastern hills half an hour after midnight. Mars follows in about twenty minutes. Jupiter rises not far from a quarter after 3 o'clock, and Venus follows half an hour later. Thus at 4 o'clock the planetary quartet may all be seen making their shining way among the stars.

Neptune diversifies his course with an event. On the 14th, at 1 o'clock in the morning, he is in quadrature on the western side of the sun, that is, he has reached the half way house between conjunction and opposition, being 90° from either point. He then rises about midnight, is on the meridian at 6 o'clock in the morning and sets about noonday. The same is true of all the outer planets, their apparent movements being regulated by the same law. Observers who keep the run of their conjunctions, quadratures, and oppositions will find it easy to follow their paths.

The right ascension of Neptune is 3 h. 16 m., his declination is 16° 18′ north, and his diameter is 2·5″.

Neptune rises on the 1st about half past 11 o'clock in the evening; on the 31st, the rises about half past 9 o'clock.

SATURN

is morning star. Though second in the order of rising, he takes the lead in the order of interest during the month, being a beautiful object in the morning sky after midnight, while every successive rising adds to the brilliancy of his appearance, and makes him more conspicuous among his peers.

Saturn is in conjunction with Alpha Tauri on the 13th at 6 o'clock in the morning. This star is better known as Aldebaran, a brilliant red star of the first magnitude. The conjunction is not a close one, Saturn being, when nearest, 3° 40′ north of the star. Planet and star will however be near enough to make a fine exhibition on the celestial canvas as they gradually approach each other, the pale gold of Saturn being in charming contrast with the ruddy hue of Aldebaran. Heavenly bodies are in conjunction when they are in the same right ascension, a term nearly corresponding with terrestrial longitude. At the same time they may be many degrees north or south of each other.

The right ascension of Saturn is 4 h. 25 m., his declination is 19° 49′ north, and his diameter is 16·4″.

Saturn rises on the 1st at half past 12 o'clock in the morning; on the 31st, he rises about half past 10 o'clock in the evening.

MARS

is morning star, and adds to the interest of the month by an incident in his slow and monotonous course. On the 29th, at 5 o'clock in the afternoon, he is in conjunction with Mu Geminorum, a star of the third magnitude in the constellation of the Twins. Mu is very near the ecliptic, or sun's path in the heavens, and near the point the sun touches on the longest day of the year. The conjunction will not be visible, Mars passing at that time 1° 4′ north of the star. But planet and star will be near enough on the morning of the 30th to make it worth while to watch their approach. An opera glass or a small telescope will assist the observation.

The right ascension of Mars is 4 h. 55 m., his declination is 22° 25′, and his diameter is 5·6″.

Mars rises on the 1st about ten minutes before 1 o'clock in the morning; on the 31st, he rises soon after midnight.

JUPITER

is morning star, and before the month closes will outshine every other star in the firmament. He holds his court in the northeast, in the constellation Gemini, a few degrees south of Castor and Pollux; but no observer of the early morning sky will fail to detect him at a glance. He will soon be near enough for telescopic observation. His return to our vicinity will be a boon to astronomers, who hope to find out something about the intense activity that now agitates his surface.

The right ascension of Jupiter is 7 h. 23 m., his declination is 22° 11′ north, and his diameter is 30·6″.

Jupiter rises on the 1st about a quarter after 3 o'clock in the morning; on the 31st, he rises at ten minutes before 2 o'clock.

VENUS

is morning star, and the last on the list to appear above the horizon. She is traveling south at a rapid pace, being nearly ten degrees farther south at the close of the month than at the beginning. Venus is now near Jupiter, but is rapidly retreating from his neighborhood, approaching the sun so closely that at the end of the month she rises less than half an hour before the great orb in whose beams she will soon be hidden from sight. She has fallen from her high estate, but only for a time. Her peerless beauty will not long remain under a cloud.

The right ascension of Venus is 7 h. 49 m., her declination is 21° 36′ north, and her diameter is 10·4″.

Venus rises on the 1st about ten minutes before 4 o'clock in the morning; on the 31st, she rises at 5 o'clock.

MERCURY

is evening star during the month, presenting but one feature of interest. He is in conjunction with Uranus on the 24th at 10 o'clock in the morning, being at that time fifty minutes south. As both planets are invisible, the event will have to be observed in the mind's eye. To those familiar with the movements of the planets, the pictures visible to the eye of fancy are not always less enjoyable than those visible to the natural eye. They also possess this advantage: Neither clouds nor the great sun himself can obscure them. Mercury makes almost a plunge toward the south during August, his declination changing from 19° north at the beginning to nearly 2° south at the close.

The right ascension of Mercury is 8 h. 58 m., his declination is 19° north, and his diameter is 5″.

Mercury sets on the 1st at half past 7 o'clock in the evening; on the 31st, he sets at twenty-two minutes after 7 o'clock.

URANUS

is evening star, and plods on his way uninterrupted, save by his meeting with Mercury.

The right ascension of Uranus is 11 h. 28 m., his declination is 4° 11′ north, and his diameter is 3·5″.

Uranus sets on the 1st about 9 o'clock in the evening; on the 31st, he sets a few minutes after 7 o'clock.

THE MOON.

The August moon fulls on the 18th at a quarter before 8 o'clock in the morning, Washington mean time. The waning moon is in conjunction with Jupiter and Venus on the 1st, and with Jupiter for the second time on the 29th. She is at her nearest point to Mercury on the 3d, and to Uranus on the 6th. On the 24th, she is very near Neptune. On the 25th, she is in close conjunction with Saturn at half past one o'clock in the afternoon, passing 1° 3′ south. In some portions of the globe between 32° and 70° south declination, where the conditions are right for observation, the moon occults Saturn for the fifth time since the year commenced. The moon completes her circuit of the planets by her conjunction with Mars on the 27th.

STORING THE POWER OF THE WIND.

As suggested previously, no method seems within the range of our present knowledge which can enable us to store the energy exerted by wind currents during the very large proportion of time when we have no need of it, and thus make its whole average force available during working hours. This, which is one of the most important desiderata in mechanics, and which is sure eventually to be secured, debars us from the benefits of the full wind power sweeping around us. But it is perhaps worth our while to consider a plan by which a portion of that power can be utilized, and, of course, just so much steam power with its attendant expense saved.

The wind of this and the adjacent regions has, as the records show, an average velocity of 7·7 miles per hour, being 676 feet per minute. At this rate of motion its pressure per square foot is $\frac{52}{100}$ of a pound, and if we could store the power we might safely calculate on that amount. But for our present purpose this is of small avail. A wind wheel of such size as formerly assumed, 12 feet by 8, gives at that pressure an effect of nominally half a horse power, and whatever it gives during working hours we are prepared to turn to account; at other times it must be of no avail.

The manufacturer or other consumer builds as many of these wheels as he deems best; the more of them the better within certain limits. On the assumption of his needing twenty horse power as before, five of them in the fresh breeze of a summer afternoon will meet the demand, while, with a strong storm-wind, a single wheel will drive his full machinery without assistance. Each wheel sends by its own air-pump its stream of air to a common reservoir. This reservoir is not, on this plan, built to contain stores of energy for future use; it is barely as an equalizer of an unsteady power. It enables the consumer to carry on his work with perfect uniformity of motion, no matter how gusty or squally the wind may be.

He chooses to run his engine, for instance, at forty pounds; setting his safety valve at sixty or eighty, or whatever he may above, he draws a regular forty without change or interruption. The only requisite is that the reservoir pressure shall be maintained sufficiently high. If his wind wheels are doing that amount of work he needs nothing further, and he can easily so construct them that the number of days in which they will need no help will be greatly in the majority in the course of a year.

But days of partial or of total calm will of course occur, and here is where the auxiliary force is required. The steam engine which he would have in use, had he no wind wheels to take its place, is called at once into play, and the machinery runs on, as on other days. The engine drives an air-pump, or pumps, of suitable dimensions, compressing air into the reservoir, that is, it does precisely what the air pumps of the wind wheels failed to do at that moment. This, of course, can be done when there is no wind whatever, and will not unfrequently need to be done when the wheels are moving feebly, and are consequently unable to keep the pressure up to the requisite number of pounds. The two sources of energy are in no way associated; they barely supply compressed air to a common reservoir, for a common purpose; they can work alone or together.

With a sufficiently liberal construction of wind wheels it is not too much to assert that the engine fire would not be lighted on more than one in three of the working days of the year, and the days when it would be needed with its full power would scarcely be one in six. Experience would soon settle all the points required, and though the introduction of the new mode of working would be watched at the first, and very naturally, with distrust, a very short time would remove it, and the two go smoothly on together.

Can any one show any reasons why this theoretical plan cannot become a practical one? It utilizes only a portion of the wind power, it is true, but is it not worth while to save what we can? If a man can save the expense of running his steam engine for two-thirds to three-fourths of the time, at barely the cost of erecting his wind engines, which will run without subsequent expense, it surely does appear that a very decided gain has been made. A.

Nickel Crucibles.

M. Mermet recommends nickel crucibles instead of silver ones for use in chemical manipulations. Nickel is slightly attacked by melted potash, and so is silver itself. Nickel crucibles cost at first much less than those made of silver, and they have the great advantage of melting at a higher temperature. It often happens that inexperienced chemists melt their silver crucibles in heating them over a gas lamp; but such an accident is not to be feared in working with crucibles made of nickel.

A CORRESPONDENT says that files may be readily cleaned of grease by holding them for a moment in a steam jet from a blow off cock.